

10/500295

DT04 Rec'd PCT/PTO 29 JUN 2004

Amendments to the Claims:

The following listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) ~~A~~An illumination system comprising:

_____ an arc tube including a light-emitting portion ~~for emitting that emits~~ light between electrodes and sealing portions that is arranged on both sides of the light-emitting portion;

_____ a first reflecting mirror that is arranged on ~~the~~a rear side of the light-emitting portion along ~~the~~a longitudinal direction of the arc tube; and

_____ a second reflecting mirror that is arranged on ~~the~~a front side of the light-emitting portion,

~~the~~a diameter D1 on ~~the~~a reflecting surface of the first reflecting mirror, indicated by ~~the~~an available marginal light emitted to the rear side from the light-emitting portion, ~~is being~~ larger than ~~the~~a diameter d1 of ~~the~~an outer surface of the second reflecting mirror; ~~mirror;~~ mirror, and the diameter d1 of the outer surface of the second reflecting mirror is being set to a size within the light of the available marginal light reflected by the first reflecting mirror; and

~~the~~a reflecting surface of the second reflecting mirror ~~surrounds~~surrounding about half of the front side of the light-emitting portion and the light emitted from ~~the~~a center of the light-emitting portion and incident on the second reflecting mirror and ~~the~~a normal of the second reflecting mirror agree with each other.

2. (Currently Amended) ~~A~~An illumination ~~system~~system, comprising:

_____ an arc tube including a light-emitting portion ~~for emitting that emits~~ light between electrodes and sealing portions that is arranged on both sides of the light-emitting portion;

_____ a first reflecting mirror that is arranged on the rear side of the light-emitting portion along ~~the~~ a longitudinal direction of the arc tube; and

_____ a second reflecting mirror that is arranged on ~~the~~ a front side of the light-emitting portion,

~~the~~ a diameter D1 on ~~the~~ a reflecting surface of the first reflecting mirror, indicated by ~~the~~ an available marginal light emitted to ~~the~~ a rear side from the light-emitting portion ~~is being~~ larger than ~~the~~ a diameter d1 of ~~the~~ an outer surface of the second reflecting mirror; ~~mirror,~~ mirror, and ~~the~~ a diameter d1 of ~~the~~ an outer surface of the second reflecting mirror is being set to a size within the light of the available marginal light reflected by the first reflecting mirror;

the second reflecting mirror ~~is being~~ arranged so that the light emitted from ~~the~~ a center of the light-emitting portion and incident on the second reflecting mirror and ~~the~~ a normal of the second reflecting mirror agree with each other; and

~~the~~ a diameter D2 at the opening end of the reflecting surface of the first reflecting mirror ~~is being~~ within the range that satisfies $\theta_e > \theta_d$ when θ_d is approximated by equation 1, by:

$$\theta_d = 90^\circ + \tan^{-1} \{ (L_e/2 + L_r) / (d_2/2) \} \text{--- Equation 1 } \{ (L_e/2 + L_r) / (d_2/2) \},$$

where L_e is ~~the~~ a distance between ~~the~~ ends of the electrodes, L_r is ~~the~~ a distance on ~~the~~ an optical axis of the illumination system from ~~the~~ a center F1 between the ends of the electrodes to ~~the~~ an opening end of ~~the~~ a reflecting surface of the second reflecting mirror, d_2 is ~~the~~ a diameter of ~~the~~ an opening end of the outer surface of the second reflecting mirror, D_2 is ~~the~~ a diameter of ~~the~~ an opening end of the reflecting surface of the first reflecting mirror, θ_d is ~~the~~ an angle formed between the light emitted from ~~the~~ an end of the electrode of the electrode ends adjacent to the first reflecting mirror without interception by the second reflecting mirror and ~~the~~ a straight line of the optical axis of the illumination

system extending toward the rear side of the illumination system, and θ_e is ~~the~~an angle formed between ~~the~~a line connecting the opening end of the reflecting surface of the first reflecting mirror and ~~the~~an end of the electrode adjacent to the first reflecting mirror together and ~~the~~a straight line of the optical axis of the illumination system extending toward the rear side of the illumination system.

3. (Currently Amended) ~~A~~An illumination ~~system-system,~~ comprising:

_____ an arc tube including a light-emitting portion ~~for emitting that emits~~ light between electrodes and sealing portions that is arranged on both sides of the light-emitting portion;

_____ a first reflecting mirror that is arranged on the rear side of the light-emitting portion along ~~the~~a longitudinal direction of the arc tube; and

_____ a second reflecting mirror that is arranged on ~~the~~a front side of the light-emitting portion,

~~the~~a diameter D1 on ~~the~~an opening end of ~~the~~a reflecting surface of the first reflecting mirror, indicated by ~~the~~an available marginal light emitted to ~~the~~a rear side from the light-emitting portion, ~~is-being~~ larger than ~~the~~a diameter d1 of ~~the~~an outer surface of the second reflecting ~~mirror; mirror,~~ and ~~the~~a diameter d1 of ~~the~~an outer surface of the second reflecting mirror ~~is-being~~ set to a size within the light of ~~the~~an ~~available~~ marginal light reflected by the first reflecting mirror;

the second reflecting mirror ~~is-being~~ arranged so that the light emitted from ~~the~~a center of the light-emitting portion and incident on the second reflecting mirror and ~~the~~a normal of the second reflecting mirror agree with each other; and

~~the~~a diameter D2 of ~~the~~an opening end of the reflecting surface of the second reflecting mirror ~~has~~having a size that allows reflection of ~~the~~a boundary light of the light

emitted from ~~the~~an end of ~~the~~an arc generating between the electrodes adjacent to the first reflecting mirror without interception by the second reflecting mirror.

4. (Currently Amended) The illumination system according to ~~one of claims 1 to 3,~~wherein claim 1, the available marginal light is being marginal light determined depending on the structure of the arc tube.

5. (Currently Amended) The illumination system according to ~~one of claims 1 to 4,~~wherein claim 1, the second reflecting mirror is being arranged to ~~the~~an outer periphery of the light-emitting portion with a space therebetween.

6. (Currently Amended) The illumination system according to ~~one of claims 1 to 5,~~wherein claim 1, the reflecting surface of the second reflecting mirror is being formed of a dielectric multilayer that transmits ultraviolet light and infrared light.

7. (Currently Amended) The illumination system according to ~~one of claims 1 to 6,~~wherein claim 1, the reflecting surface of the second reflecting mirror is being formed by face-grinding or press-molding a pipe having an inside diameter larger than the outside diameter of the sealing portion.

8. (Currently Amended) The illumination system according to ~~one of claims 1 to 7,~~wherein claim 1, the outer surface of the second reflecting mirror is being formed so as to allow the light incident from the reflecting surface side to transmit.

9. (Currently Amended) The illumination system according to ~~one of claims 1 to 7,~~wherein claim 1, the outer surface of the second reflecting mirror is being formed so as to diffuse-reflect the light incident from the reflecting surface side.

10. (Currently Amended) The illumination system according to ~~one of claims 1 to 9,~~wherein claim 1, the second reflecting mirror is being made of any of quartz, light-transmissive alumina, crystal, sapphire, YAG, and fluorite.

11. (Currently Amended) The illumination system according to ~~one of claims 1 to 10, wherein the claim 1, an~~ outer circumference of the light-emitting portion is being coated with antireflection coating.

12. (Currently Amended) The illumination system according to ~~one of claims 1 to 11, wherein claim 1, the~~ second reflecting mirror is being firmly fixed to ~~the a~~ surface of ~~the a~~ sealing portion in ~~the a~~ vicinity of the light-emitting portion with an adhesive.

13. (Currently Amended) The illumination system according to claim 12, ~~wherein~~ the adhesive is being an inorganic adhesive containing a mixture of silica and alumina or aluminum nitride.

14. (Currently Amended) The illumination system according to ~~one of claims 1 to 12, wherein claim 1, the~~ second reflecting mirror is being pressure-fixed to ~~the a~~ vicinity of the light-emitting portion of the arc tube with a spring wound around ~~the an~~ outer circumference of ~~the a~~ sealing portion with a space therebetween.

15. (Currently Amended) The illumination system according to claim 14, ~~wherein~~ the spring is being formed of a conductive winding, one end of the conductive winding being connected to a lead wire extending from the sealing portion opposite to the spring.

16. (Currently Amended) A ~~projector-projector,~~ comprising a an illumination system and an optical modulator ~~for modulating that modulates~~ an incident light from the illumination system in accordance with given image information, ~~wherein the illumination system according to one of claims 1 to 15 as the illumination system, being the illumination system as recited in claim 1.~~

17. (Currently Amended) A method for manufacturing a an illumination system system, comprising:

_____ an arc tube including a light-emitting portion ~~for emitting that emits~~ light between electrodes and sealing portions that is arranged on both sides of the light-emitting portion;

_____ a first reflecting mirror that is arranged on ~~the~~ a rear side of the light-emitting portion along ~~the~~ a longitudinal direction of the arc tube and ~~serving that serves~~ as a main reflecting mirror; and

_____ a second reflecting mirror that is arranged on ~~the~~ a front side of the light-emitting portion and ~~serving that serves~~ as an auxiliary reflecting mirror,

_____ comprising the steps of the method comprising:

fixing the arc tube and the second reflecting mirror together, after adjusting ~~the~~ a relative position between the second reflecting mirror and the arc tube such that ~~the~~ real images of the electrodes or ~~the~~ real image of an interelectrode arc of the arc tube overlap with the reflected images of the electrodes or the reflected image of the interelectrode arc reflected by the second reflecting mirror; and

fixing the arc tube and the first reflecting mirror together, after arranging the arc tube and the first reflecting mirror such that ~~the~~ a center of the electrodes of the arc tube having the second reflecting mirror fixed thereto substantially agrees with a first focus of the first reflecting mirror and adjusting ~~the~~ a relative position between the arc tube and the first reflecting mirror so that ~~the~~ a luminance of the first reflecting mirror is maximum in a specified position.

18. (Currently Amended) The method for manufacturing ~~a~~ an illumination system according to claim 17, ~~wherein~~ the step of fixing the arc tube and the second reflecting mirror together ~~comprises the~~ further comprising a process of detecting ~~the~~ real image and ~~the~~ reflected image from at least two directions by using a pickup image with a camera, adjusting

the position of the second reflecting mirror so that the real image overlaps with the reflected image in each direction, and fixing the arc tube and the second reflecting mirror together.

19. (Currently Amended) The method for manufacturing ~~a~~an illumination system according to ~~claim 17 or 18, wherein the~~ claim 17, a specified position ~~is being~~ a design second focus of the first reflecting mirror; and the step of fixing the arc tube and the first reflecting mirror together ~~comprises including~~ the process of fixing the arc tube and the first reflecting mirror together after adjusting the relative position between the arc tube and the first reflecting mirror so that the luminance in ~~the~~ a vicinity of the design second focus of the first reflecting mirror is maximum.

20. (Currently Amended) The method for manufacturing ~~a~~an illumination system according to ~~claim 17 or 18, wherein the~~ claim 17, a specified position ~~is the being a~~ position at which an illumination object of an optical system that mounts the illumination system ~~is~~ can be arranged; and the step of fixing the arc tube and the first reflecting mirror together ~~comprises including~~ the process of fixing the arc tube and the first reflecting mirror together after incorporating the illumination system to the optical system and adjusting ~~the~~ a relative position between the arc tube and the first reflecting mirror so that the luminance at the position in which the illumination object is arranged, becomes maximum.

21. (New) The illumination system according to claim 16, the available marginal light being marginal light determined depending on the structure of the arc tube.

22. (New) The illumination system according to claim 16, the second reflecting mirror being arranged to an outer periphery of the light-emitting portion with a space therebetween.

23. (New) The illumination system according to claim 16, the reflecting surface of the second reflecting mirror being formed of a dielectric multilayer that transmits ultraviolet light and infrared light.

24. (New) The illumination system according to claim 16, the reflecting surface of the second reflecting mirror being formed by face-grinding or press-molding a pipe having an inside diameter larger than the outside diameter of the sealing portion.

25. (New) The illumination system according to claim 16, the outer surface of the second reflecting mirror being formed so as to allow the light incident from the reflecting surface side to transmit.

26. (New) The illumination system according to claim 16, the outer surface of the second reflecting mirror being formed so as to diffuse-reflect the light incident from the reflecting surface side.

27. (New) The illumination system according to claim 16, the second reflecting mirror being made of any of quartz, light-transmissive alumina, crystal, sapphire, YAG, and fluorite.

28. (New) The illumination system according to claim 16, an outer circumference of the light-emitting portion being coated with antireflection coating.

29. (New) The illumination system according to claim 16, the second reflecting mirror being firmly fixed to a surface of a sealing portion in a vicinity of the light-emitting portion with an adhesive.

30. (New) The illumination system according to claim 29, the adhesive being an inorganic adhesive containing a mixture of silica and alumina or aluminum nitride.

31. (New) The illumination system according to claim 16, the second reflecting mirror being pressure-fixed to a vicinity of the light-emitting portion of the arc tube with a spring wound around an outer circumference of a sealing portion with a space therebetween.

32. (New) The illumination system according to claim 31, the spring being formed of a conductive winding, one end of the conductive winding being connected to a lead wire extending from the sealing portion opposite to the spring.

33. (New) The illumination system according to claim 2, the available marginal light being marginal light determined depending on the structure of the arc tube.

34. (New) The illumination system according to claim 2, the second reflecting mirror being arranged to an outer periphery of the light-emitting portion with a space therebetween.

35. (New) The illumination system according to claim 2, the reflecting surface of the second reflecting mirror being formed of a dielectric multilayer that transmits ultraviolet light and infrared light.

36. (New) The illumination system according to claim 2, the reflecting surface of the second reflecting mirror being formed by face-grinding or press-molding a pipe having an inside diameter larger than the outside diameter of the sealing portion.

37. (New) The illumination system according to claim 2, the outer surface of the second reflecting mirror being formed so as to allow the light incident from the reflecting surface side to transmit.

38. (New) The illumination system according to claim 2, the outer surface of the second reflecting mirror being formed so as to diffuse-reflect the light incident from the reflecting surface side.

39. (New) The illumination system according to claim 2, the second reflecting mirror being made of any of quartz, light-transmissive alumina, crystal, sapphire, YAG, and fluorite.

40. (New) The illumination system according to claim 2, an outer circumference of the light-emitting portion being coated with antireflection coating.

41. (New) The illumination system according to claim 2, the second reflecting mirror being firmly fixed to a surface of a sealing portion in a vicinity of the light-emitting portion with an adhesive.

42. (New) The illumination system according to claim 41, the adhesive being an inorganic adhesive containing a mixture of silica and alumina or aluminum nitride.

43. (New) The illumination system according to claim 2, the second reflecting mirror being pressure-fixed to a vicinity of the light-emitting portion of the arc tube with a spring wound around an outer circumference of a sealing portion with a space therebetween.

44. (New) The illumination system according to claim 43, the spring being formed of a conductive winding, one end of the conductive winding being connected to a lead wire extending from the sealing portion opposite to the spring.

45. (New) A projector, comprising an illumination system and an optical modulator that modulates an incident light from the illumination system in accordance with given image information, the illumination system being the illumination system as recited in claim 2.

46. (New) The illumination system according to claim 45, the available marginal light being marginal light determined depending on the structure of the arc tube.

47. (New) The illumination system according to claim 45, the second reflecting mirror being arranged to an outer periphery of the light-emitting portion with a space therebetween.

48. (New) The illumination system according to claim 45, the reflecting surface of the second reflecting mirror being formed of a dielectric multilayer that transmits ultraviolet light and infrared light.

49. (New) The illumination system according to claim 45, the reflecting surface of the second reflecting mirror being formed by face-grinding or press-molding a pipe having an inside diameter larger than the outside diameter of the sealing portion.

50. (New) The illumination system according to claim 45, the outer surface of the second reflecting mirror being formed so as to allow the light incident from the reflecting surface side to transmit.

51. (New) The illumination system according to claim 45, the outer surface of the second reflecting mirror being formed so as to diffuse-reflect the light incident from the reflecting surface side.

52. (New) The illumination system according to claim 45, the second reflecting mirror being made of any of quartz, light-transmissive alumina, crystal, sapphire, YAG, and fluorite.

53. (New) The illumination system according to claim 45, an outer circumference of the light-emitting portion being coated with antireflection coating.

54. (New) The illumination system according to claim 45, the second reflecting mirror being firmly fixed to a surface of a sealing portion in a vicinity of the light-emitting portion with an adhesive.

55. (New) The illumination system according to claim 54, the adhesive being an inorganic adhesive containing a mixture of silica and alumina or aluminum nitride.

56. (New) The illumination system according to claim 45, the second reflecting mirror being pressure-fixed to a vicinity of the light-emitting portion of the arc tube with a spring wound around an outer circumference of a sealing portion with a space therebetween.

57. (New) The illumination system according to claim 56, the spring being formed of a conductive winding, one end of the conductive winding being connected to a lead wire extending from the sealing portion opposite to the spring.

58. (New) The illumination system according to claim 3, the available marginal light being marginal light determined depending on the structure of the arc tube.

59. (New) The illumination system according to claim 3, the second reflecting mirror being arranged to an outer periphery of the light-emitting portion with a space therebetween.

60. (New) The illumination system according to claim 3, the reflecting surface of the second reflecting mirror being formed of a dielectric multilayer that transmits ultraviolet light and infrared light.

61. (New) The illumination system according to claim 3, the reflecting surface of the second reflecting mirror being formed by face-grinding or press-molding a pipe having an inside diameter larger than the outside diameter of the sealing portion.

62. (New) The illumination system according to claim 3, the outer surface of the second reflecting mirror being formed so as to allow the light incident from the reflecting surface side to transmit.

63. (New) The illumination system according to claim 3, the outer surface of the second reflecting mirror being formed so as to diffuse-reflect the light incident from the reflecting surface side.

64. (New) The illumination system according to claim 3, the second reflecting mirror being made of any of quartz, light-transmissive alumina, crystal, sapphire, YAG, and fluorite.

65. (New) The illumination system according to claim 3, an outer circumference of the light-emitting portion being coated with antireflection coating.

66. (New) The illumination system according to claim 3, the second reflecting mirror being firmly fixed to a surface of a sealing portion in a vicinity of the light-emitting portion with an adhesive.

67. (New) The illumination system according to claim 66, the adhesive being an inorganic adhesive containing a mixture of silica and alumina or aluminum nitride.

68. (New) The illumination system according to claim 3, the second reflecting mirror being pressure-fixed to a vicinity of the light-emitting portion of the arc tube with a spring wound around an outer circumference of a sealing portion with a space therebetween.

69. (New) The illumination system according to claim 68, the spring being formed of a conductive winding, one end of the conductive winding being connected to a lead wire extending from the sealing portion opposite to the spring.

70. (New) A projector, comprising an illumination system and an optical modulator that modulates an incident light from the illumination system in accordance with given image information, the illumination system being the illumination system as recited in claim 8.

71. (New) The illumination system according to claim 70, the available marginal light being marginal light determined depending on the structure of the arc tube.

72. (New) The illumination system according to claim 70, the second reflecting mirror being arranged to an outer periphery of the light-emitting portion with a space therebetween.

73. (New) The illumination system according to claim 70, the reflecting surface of the second reflecting mirror being formed of a dielectric multilayer that transmits ultraviolet light and infrared light.

74. (New) The illumination system according to claim 70, the reflecting surface of the second reflecting mirror being formed by face-grinding or press-molding a pipe having an inside diameter larger than the outside diameter of the sealing portion.

75. (New) The illumination system according to claim 70, the outer surface of the second reflecting mirror being formed so as to allow the light incident from the reflecting surface side to transmit.

76. (New) The illumination system according to claim 70, the outer surface of the second reflecting mirror being formed so as to diffuse-reflect the light incident from the reflecting surface side.

77. (New) The illumination system according to claim 70, the second reflecting mirror being made of any of quartz, light-transmissive alumina, crystal, sapphire, YAG, and fluorite.

78. (New) The illumination system according to claim 70, an outer circumference of the light-emitting portion being coated with antireflection coating.

79. (New) The illumination system according to claim 70, the second reflecting mirror being firmly fixed to a surface of a sealing portion in a vicinity of the light-emitting portion with an adhesive.

80. (New) The illumination system according to claim 79, the adhesive being an inorganic adhesive containing a mixture of silica and alumina or aluminum nitride.

81. (New) The illumination system according to claim 70, the second reflecting mirror being pressure-fixed to a vicinity of the light-emitting portion of the arc tube with a spring wound around an outer circumference of a sealing portion with a space therebetween.

82. (New) The illumination system according to claim 81, the spring being formed of a conductive winding, one end of the conductive winding being connected to a lead wire extending from the sealing portion opposite to the spring.